Citation:

Kounosu M, Kaneko S. Antibacterial activity of antibacterial cutting boards in household kitchens. *Biocontrol Sci.* 2007 Dec; 12 (4): 123-130.

PubMed ID: 18198718

Study Design:

Case-Control Study

Class:

C - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To assess the following:

- Correlation between the antibacterial activity value two as defined by the Japanese Standards Association 2000 (JIS Z 2801) and the value obtained by monitoring cutting boards actually used in ordinary homes
- Investigation of bacteria detected in the kitchen environment
- Effect of common, commercially available antibacterial agents upon the bacteria detected.

Inclusion Criteria:

- Antibacterial cutting boards whose antibacterial activity values were adjusted to be two or four
- Untreated polypropylene cutting boards with antibacterial activity values of two or four.

Exclusion Criteria:

None specifically mentioned

Description of Study Protocol:

Recruitment

Cutting boards from ten different households

Design

Case-control study

Blinding used

Not applicable

Intervention

Not applicable

Statistical Analysis

Not described

Data Collection Summary:

Timing of Measurements

- 10 households used each of the boards on successive days
- Every day the households washed their cutting boards after use with a scrubbing brush and running water and let them dry naturally
- Before using the cutting board the next day, they swabbed a 10 x 10cm area with Q-tips
- Q-tips were collected and examined at one, two, four and six weeks.

Dependent Variables

- Changes in the viable cell counts of several types of bacteria were measured with the drop plate method
- Detected bacterial flora was also identified and the minimum antimicrobial concentrations of several commonly used antibacterial agents (silver and organic hybrid agents, silver-zeolite agents, silver-zirconium phosphate agents, silver-glass agents, organic pyridine agents) were measured against the kinds of bacteria identified to determine the expected antibacterial activity of the respective agents.

Independent Variables

- Antibacterial cutting boards
- Cutting boards with no antibacterial activity.

Control Variables

Description of Actual Data Sample:

- ***Initial N****:* 10 households used each kind of board
- ***Attrition (final N):*** As above
- ***Age****:* Not applicable
- ***Ethnicity****:* Not applicable
- ***Other relevant demographics****:* Not applicable
- ***Anthropometrics:*** Not applicable
- ***Location****:* Japan.

Summary of Results:

Key Findings

- Cutting boards with activity values of both two and four proved to be antibacterial in actual use, although no correlation between the viable cell counts and the antibacterial activity values were observed
- The activity values of the boards with activity values of two were 2.24 against *Staphylococcus aureus* and 2.10 against *Escherichia coli*
- The boards with activity values of four had activity values of 3.88 against *Staphylococcus aureus* and 3.68 against *Escherichia coli*
- The cutting boards were less effective for inhibiting *Escherichia coli* than for *Staphylococcus aureus*
- In the kitchen environment, large quantities of *Pseudomonas*, *Flavobacterium*, *Micrococcus* and *Bacillus* were detected, and it was confirmed that common antibacterial agents used in many antibacterial products are effective against these bacterial species
- The concentrations of common bacteria tended to be greater on untreated cutting boards used for the same periods
- *Lactobacillus* is less sensitive to antibacterial agents compared to more common bacteria
- The most common bacteria found in and around the kitchen sinks of the households tested are *Flavobacterium* and *Micrococcus*
- Our findings revealed that the antibacterial cutting boards tested were capable of inhibiting the growth of most common bacteria, although no correlation was observed between their inhibitory effect and the antibacterial activity value.

Author Conclusion:

Using cutting boards impregnated with antibacterial agents, we evaluated the inhibitory effect of the active agents and confirmed the following:

- Products with antibacterial activity values of two or above exhibit some inhibitory activity on the bacteria found in household environments
- Compared to common bacteria, lactobacilli are more resistant to antibacterial agents used in antibacterial products
- In the kitchen environment, the most common genera detected on cutting boards include *Pseudomonas*, *Flavobacterium*, *Micrococcus* and *Bacillus,* although this could change depending on the food items being prepared.

In this study, we conducted our tests on cutting boards, one of many household products containing antibacterial agents. Given that variation due to the environment and product type will encourage the growth of different bacterial species, future research should evaluate antibacterial activity of such products under situations of actual use. In addition, such findings should be correlated with the set antibacterial value assigned to such products.

Reviewer Comments:

Statistical analysis not described. Author's note that the differences between the households can be attributed to the different ingredients used, frequency of cooking and several other related factors.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	???
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	???
2.2.	Were criteria applied equally to all study groups?	???
2.3.	Were health, demographics, and other characteristics of subjects described?	???
2.4.	Were the subjects/patients a representative sample of the relevant population?	???
3.	**Were study groups comparable?**	???
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	???
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A

3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	???
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	Yes
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A

6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	???
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	???
8.1.	Were statistical analyses adequately described and the results reported appropriately?	No
8.2.	Were correct statistical tests used and assumptions of test not violated?	???
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	No
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	???
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	???
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	???
9.1.	Is there a discussion of findings?	Yes

9.2.	Are biases and study limitations identified and discussed?	No
10.	**Is bias due to study's funding or sponsorship unlikely?**	???
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	???